

## The University of Maine DigitalCommons@UMaine

---

Honors College

---

Spring 2014

# An Investigation on the Effects of Virtual Social Support on Working Memory and Stress

Erin Perry

*University of Maine - Main*

Follow this and additional works at: <https://digitalcommons.library.umaine.edu/honors>



Part of the [Applied Behavior Analysis Commons](#), [Experimental Analysis of Behavior Commons](#), and the [Social Psychology Commons](#)

---

### Recommended Citation

Perry, Erin, "An Investigation on the Effects of Virtual Social Support on Working Memory and Stress" (2014). *Honors College*. 156.  
<https://digitalcommons.library.umaine.edu/honors/156>

This Honors Thesis is brought to you for free and open access by DigitalCommons@UMaine. It has been accepted for inclusion in Honors College by an authorized administrator of DigitalCommons@UMaine. For more information, please contact [um.library.technical.services@maine.edu](mailto:um.library.technical.services@maine.edu).

AN INVESTIGATION ON THE EFFECTS OF VIRTUAL SOCIAL SUPPORT ON  
WORKING MEMORY AND STRESS

by

Erin L. Perry

A Thesis Submitted in Partial Fulfillment  
of the Requirements for a Degree with Honors  
(Psychology)

The Honors College

University of Maine

May 2014

Advisory Committee:

Shawn Ell, Ph.D., Ph. D., Associate Professor of Psychology, Advisor  
Shannon McCoy, Ph. D., Assistant Professor of Psychology  
Jordan P. LaBouff, Ph.D., Honors Preceptor of Psychology  
Steven Hutchinson, Doctoral Candidate, Psychology  
Edith Pratt Elwood, Adjunct Assistant Professor, Honors College (Sociology)

## Abstract

Stress has a negative effect on day-to-day behavior and cognition. Face-to-face social interactions often induce feelings of social support, which works to counteract the negative effects of stress. However, it is unclear if virtual interactions offer the same benefits as face-to-face interactions. This study explores the relationship between perceived stress levels and their effect on perceived social support and working memory functioning. We also explored how mood is affected by stressful experiences. Participants engaged in a laboratory stressor, where participants submerged their hand in cold water, to elicit an appropriate stress response. After the stress task, participants engaged in a supportive imagined interaction and completed a working memory task. We found that an imagined virtual interaction does not induce feelings of social support when compared to a control condition. We also saw no significant difference in positive or negative affect after the supportive interaction and no effect on working memory performance. Our findings suggest that imagining supportive interaction is not an effective way to induce feelings of social support and does not increase positive affect after experiencing a stressful event.

### **Acknowledgements**

I would like to thank Shawn Ell, Shannon McCoy, Jordan LaBouff, Steven Hutchinson, and Edith Elwood for their continued support and guidance during completion of this research. I would also like to thank Thane Fremouw for allowing me to borrow his laboratory to fill up the apparatus for my stress task. Finally, I would like to thank the College of Liberal Arts and Sciences for providing funding for my Honors Thesis.

## Table of Contents

Introduction	1
Stress	1
Social Support	3
Implications for Cognitive Functioning	5
Overview of Current Research	6
Method	7
Participants	7
Materials	8
Procedures	10
Results	14
Stress	14
Social Support	15
PANAS-x	17
Working Memory	19
Questionnaires	22
Discussion	23
Implications and Limitations	24
Conclusion	26
References	29
Appendices	33
PANAS-x	33
Stress Appraisal	35

Internet Behaviors and Attitudes Scale	36
Pathological Use Scale	38
Facebook Questionnaire	39
Demographic Survey	43
IRB Approval	44
Author's Biography	48

## Lists of Tables and Figures

Table 1: Demographic Characteristics of Participants	8
Figure 1: Application of the 2-Back Task	10
Figure 2: Timeline of the Experiment	13
Table 2: Medians and Interquartile Ranges for Perceived Stress Ratings on CPT and WPT	14
Figure 3: Average Perceived Stress	15
Figure 4: Average Perceived Support	15
Table 3: Means and Standard Deviations for PANAS-x Difference Scores	17
Figure 5: Average Difference Scores for Positive Affect	18
Figure 6: Average Difference Scores for Negative Affect	18
Figure 7: Average Accuracy on the 2- and 3- Back Task	20
Figure 8: Average Reaction Time on the 2- and 3- Back Task	21
Table 4: Means and Standard Deviations for Pathological Use Scale, Internet Behaviors and Attitudes Scale, and Facebook Questionnaire	22

## An Investigation on the Effects of Virtual Social Support on Working Memory and Stress

In today's society, there are a large number of individuals who engage with social media. Because the use of social media is so prevalent, it is unclear how these interactions are affecting how we function from day-to-day. In particular, it is unclear if these virtual interactions affect our stress levels. Appropriately, there is a large body of literature that notes the importance of social support from face-to-face interactions and how it affects stress. It is uncertain, though, if support perceived from a virtual interaction will have a similar effect. Because of the limited research, the current experiment focuses on the relationship between virtual interactions, and how these interactions may have a positive effect on stress levels.

In the remainder of the introduction, I discuss what stress and social support are, as well as how stress and social support affect daily functioning. Additionally, I examine the effects of stress levels on working memory functioning.

### **Stress**

Stress is anything that is perceived by an individual to disrupt their ability to function as normal (Chrousos, 2009). Everyone experiences stress and research has shown that stress can have negative consequences on daily functioning (Oei et al., 2006). A stressor can cause feelings of stress and a stress response is how an individual reacts to the stressor.

Stress can be absolute or relative. Absolute stress is a type of stressor that causes a stress response in every person. Relative stressors cause stress responses in only certain people (Lupien et al, 2007). Relative stressors are typically present in the environment and affect us as we function from day to day. Lazarus and Folkman (1987) note in their



Transactional Theory of Stress that recognizing feelings of stress is important for responding and coping with stress, so that normal functioning can occur. Because relative stressors do not elicit a stress response in everyone, the way an individual responds to the stressor is essential in coping with the stress.

Stress can also be induced experimentally. The Cold Pressor Test (CPT) elicits a physiological stress response by having participants submerge their non-dominant hand in frigid water for as long as they can stand it (Hines & Brown, 1936). Submerging a hand in cold water causes the blood vessels to contract, causing an increase in blood pressure. This experimental stressor activates a physiological response (Schwabe, Haddad, & Schachinger, 2008). Schwabe and his colleagues also demonstrate that if a person was being “socially evaluated” while they engage in the CPT, there is an increased physiological response when compared to those who were not socially evaluated. Even without social evaluation, the increase in physiological responses was significant compared to those who participated in a warm water control (Smeets et al., 2008).

Physiological responses are not the only way to determine if an individual is experiencing stress. In addition to measuring physiological responses, McRae and colleagues (2006) asked their participants to provide a subjective stress rating after completing the CPT. These self-reports were positively associated with physiological responses. Research has also shown no relationship between perceived stress and physiological responses. Hellhammer and Schubert (2012) saw an association between perceived stress and physiological stress during a social stressor, but not after. This suggests that the relationship between perceived stress and physiological stress is not

consistent. The present research utilizes the CPT and employs a self-reported stress measure.

### **Social Support**

Social support is the idea that someone feels as though they are loved and cared for by others. A benefit of these feelings of love and support is protection from a myriad of stressful situations (Cobb, 1976). Cobb discusses how important social support is in relation to stress over a variety of potentially stressful life occurrences. He notes that social support can even help reduce the amount of medical treatment a person may need if they have a strong support network.

Usually, feeling of social support is gained through a network of family and friends (Bloom, 1990). In research conducted with gay, lesbian and heterosexual couples, Graham and Barnow (2013) found that individuals reporting more partner support had a higher sense of well-being and had a less negative stress impact than those who reported less partner support. The individuals who reported higher partner support also reported better relationship quality.

Typically, social support is experienced in face-to-face exchanges, but can be experienced in virtual interactions as well. LaCoursiere (2001) defines virtual social support as a way to gain positive experiences from others in a virtual setting. Virtual social support is similar to face-to-face social support, but these interactions often take place without the individuals communicating face-to-face. It is uncertain the extent to how effective virtual interactions are in creating feelings of social support. Everybody wants to feel as though they are loved and cared for by others, particularly by people they know.

Trepte, Reinecke, and Juechems (2012) found when people play video games on the internet they experience virtual social support, from either people they know or random people. Playing video games online is communicative, and when individuals engage in video games online, they often are required to work together with others to complete a quest or solve a puzzle. They also determined that the virtual social support reported from online video game use can be positively related to support experienced from face-to-face social interactions.

However, online gaming is not the most common form of virtual social support; using Facebook is far more common than playing video games. While using Facebook, individuals have the ability (whether they use it or not) to communicate with people they know in person, such as family and friends, suggesting that people may base their online relationships off of their offline relationships (Jin, 2013). While family and friends typically make up a “Friend List” on Facebook, it is possible that individuals are Facebook friend with people they do not communicate with in person. Jin noted that individuals with more friends in a “Friend List” than in face-to-face contexts report feeling more lonely. This can be explained as a need to have more social connections to make up for the fewer number of friends in their real-life social circle, suggesting that virtual social support may act as an adequate supplement for social support gained through face-to-face interactions.

The benefits of virtual social support can be backed by the Rich-Get-Richer Hypothesis (Kraut et al., 2002). This hypothesis suggests that individuals who have more social ties offline are more likely to benefit from continued social ties online. They also note that those who do not have as many social ties online do not benefit as much from

internet use. The research Jin (2013) conducted is consistent with this hypothesis: people tend to base their virtual relationships off of their online ones, and it makes sense that those with more social ties are going to benefit more from internet use.

The research Jin conducted (2013) is also consistent with the Social Compensation Hypothesis (McKenna & Bargh, 1999). This hypothesis states that the internet may act as a form of social compensation: lonely individuals and socially anxious individuals may feel more comfortable interacting with others in a virtual setting. Because these individuals feel more comfortable interacting with others in a virtual setting, they feel less lonely and experience lower levels of depression, which compensates for face-to-face interactions they may not have.

Even though there is research that suggests the benefits of virtual social support, there is also research to suggest that there are no benefits from virtual interactions. The Displacement Hypothesis (Kraut et al., 1998) states that increased internet use may lead to a decrease in the amount of communication an individual does with their family face-to-face. Essentially, people are less willing to speak with others in a face-to-face setting because they are spending larger amounts of time on the internet. The Displacement Hypothesis is problematic because increases in depression and loneliness have been associated with an increase in internet use. This may suggest that online relationships and interactions are not as beneficial for inducing feelings of social support as face-to-face interactions.

### **Implications for Cognitive Functioning**

Working memory is the process used for temporarily storing and manipulating information (Baddeley, 2003), and is essential for daily functioning. Deficits in working

memory functioning are present when an individual is experiencing a stressful event (Schoofs et al., 2008). Schoofs and his colleagues found that participants exposed to a social stressor exhibited significantly slower reaction times on a working memory task when compared to their non-stressed counterparts. Experiencing a stressful event can be attributed to a decrease in the number of correct answers between the stressed group and the non-stressed control group. Because of these slower reaction times and fewer items correct, they were able to conclude that the stress experienced by the participants led to these working memory deficits.

The use of a working memory task is another way to show the efficacy of social support against the negative effects of stress. Because stress has a negative effect on working memory performance and functioning, we expect to see a decrease in accuracy and reaction time on a working memory task for those not reporting social support. The protecting effects of social support have the potential to maintain working memory functioning and show no deficit.

### **Overview of the Current Research**

The present research focuses on how social support can be potentially experienced from social networking sites and that there can be a positive effect on mood and working memory performance because of this. Prior research has shown the negative effects of stress on everyday functioning, and research has also demonstrated that social support can counteract the negative consequences of stress. One negative consequence of stress is a decrease in working memory functioning. With adequate social support, there may not be any negative effects on working memory functioning. It is hypothesized that:

- After being exposed to a stressor (the CPT), participants will report more stress than those who were not exposed to stress.
- Imagining a supportive conversation on Facebook (supportive interaction) will elicit feelings of social support compared to those who do not imagine a conversation on Facebook (neutral interaction).
- Participants will experience an increase in positive affect after imagining a supportive conversation compared to those who completed a neutral imagined interaction.
- Those who experience a stressor and complete the supportive interaction will not have a working memory deficit compared to those who complete the neutral imagined interaction.

## **Method**

### **Participants**

Thirty-four participants were recruited from the Psychology Department participant pool (see Table 1 for demographics and test scores). Exclusionary criteria were as follows: They had to be at least 18 years of age, not pregnant, no history of cardiovascular disease, no history of fainting or seizures, no history of frostbite or Reynaud's phenomenon, and no history of anxiety disorders. All participants received partial course credit in return for participation.

Table 1. Demographic Characteristics of Participants

	CPT/NEU <i>n</i> = 9	CPT/SUP <i>n</i> = 9	WPT/NEU <i>n</i> = 7	WPT/SUP <i>n</i> = 9
Age in years	19.4 (.88)	18.7 (.87)	18.9 (.69)	18.5 (.53)
Gender N (%)				
Female	7 (77%)	5 (55%)	5 (71%)	6 (67%)
Male	2 (22%)	4 (45%)	2 (29%)	3 (33%)

*Note:* Means and standard deviations are displayed as follows: *M*(*SD*). CPT- Cold Pressor Test; WPT- Warm Pressor Test; NEU- Neutral; SUP- Supportive

## Materials

*Experimental Stressor: Cold Pressor Test/ Warm Pressor Test Apparatus:* The Cold Pressor Test (CPT) is a common stress induction protocol that has been used in many studies (von Bayer et al., 2005; Ishizuka, Hillier & Beversdorf, 2007). The CPT apparatus consisted of a cooler divided into two compartments by a piece of plywood with holes drilled in it to allow water flow between the compartments. For the CPT, one compartment contained frigid water (participants submerged their hand in this compartment), and the other contained ice and water. For control purposes, a warm water test was used (Warm Pressor Test, WPT). For the WPT, the same apparatus was used as the CPT, but the entire cooler was filled with warm water and was kept warm with an aquarium heater. An aquarium pump was used to facilitate the circulation of water and the temperature was monitored periodically.

*Measure of Mood:* Mood was self-reported using the Positive and Negative Affect Schedule- Expanded Form (PANAS-x; Watson & Clark, 1994; Appendix A). A word representing an affective state was presented to the participants and they were asked to respond on a Likert scale from 1 (very slightly or not at all) to 5 (extremely) about how they were feeling at the present moment.

*Measure of Stress:* Stress was a self-reported appraisal. Participants were asked to report how stressed they felt about the task they had just completed (the CPT/WPT) on a Likert scale from 1 (strongly disagree) to 7 (strongly agree). The measure used was adapted from a measure used by Ell et al. (2011) and is commonly used in Social Psychology laboratories at the University of Maine (Appendix B).

*Measure of Internet Behaviors and Attitudes:* Participants were asked to indicate whether they agreed or disagreed with various attitudes and behaviors related to internet use (Internet Behaviors and Attitudes Scale; Morahan-Martin & Schumacher, 2000; Appendix C). The questionnaire included items related to the advantages of internet use, ease of communication and how the participant presented themselves online. The participants were asked to rate twenty-five items using a four point Likert scale, with one being the lowest (strongly disagree) and four being the highest (strongly-agree).

*Measure of Pathological Internet Use:* Participants were asked to report how strongly they agreed or disagreed with potentially problematic Internet behaviors (Pathological Use of Internet Scale; Morahan-Martin & Schumacher, 2000; Appendix D). This scale measured the extent to which an individual agreed with potentially problematic internet use. The thirteen items were rated using a four point scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*).

*Measure of Facebook Use:* Participants were asked to provide information about their typical use of the variety of functions available on Facebook (Facebook Questionnaire; Ross et al., 2009; Appendix E). The original questionnaire has been shortened to exclude questions irrelevant to the purpose of the study.



*Demographic Information:* Participants were asked to provide general demographic information, including age, gender, major and year in school, and relationship status (Appendix F). This questionnaire is designed specifically for this project and will allow the principle investigator to control any variables during the data analysis procedures.

### **Procedure**

After providing consent, participants began the experiment with two practice blocks of a working memory task (N-Back Task; Kirchner, 1958; Figure 2) that they completed later on in the experiment.

Briefly, during the N-Back task, participants were presented with a series of numbers (e.g., 2, 5, 7, 6, 4, 6) and asked to respond “yes” if the current character matched the one presented  $n$  characters ago and “no” if the current character did not match. For the current experiment,  $n$  varied between 2 and 3 (Figure 2, Schoofs, Preuß, & Wolf, 2008). During the practice trails, participants were given feedback on correct and incorrect matches.

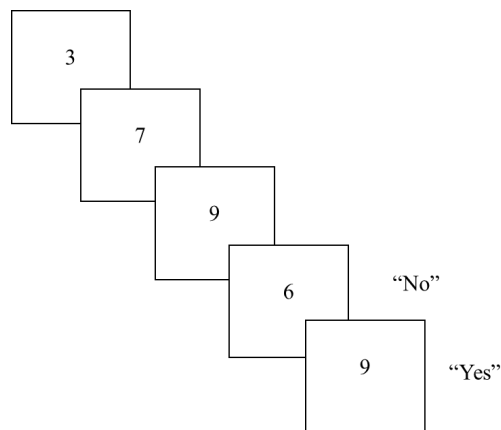


Figure 1. Application of the N-Back Task (2-Back)

Following the practice N-Back trials, participants engaged in a 15 minute relaxation period where they listened to classical music (no lyrics) and were asked to refrain from using their phones and any other electronic devices.

The participants were then asked to complete the PANAS-x (Watson & Clark, 1994) to assess any changes in affective state the participant may experiences during the course of the experiment. Once the PANAS-x was completed, the participants were randomly assigned to either the CPT or the WPT.

For the CPT, participants were asked to place their non-dominant hand in frigid water, maintained on average of 5.8°C. They were asked to keep their hand submerged in the water for three minutes, but were free to remove their hand at any time. They were instructed that there was no consequence for removing their hand before the three minutes were completed. Those randomly assigned the warm water condition were asked to keep their non-dominant hand submerged in warm water (31.8°C, on average) for three minutes and were free to remove their hand at any time, as with the CPT. During this task, the experimenter was present and all participants were timed.

Upon completion of the CPT or WPT, participants were asked to complete a stress appraisal. The appraisal was used here as a manipulation check to ensure that the CPT elicited an appropriate stress response.

Next, participants were randomly selected to be in either the supportive condition or the neutral condition. In the supportive condition, participants were instructed to imagine an interaction on Facebook about the water task they had just completed (the CPT or the WPT) in which the Facebook conversation was supportive (e.g., more meaningful conversation, demonstrating interest and concern for their experience):

Imagine that you write a Facebook status about your experience with the water task. Upon posting the status, there is a lot of activity expressing sympathy for what you had just experienced. Imagine someone wrote a comment and engages you in conversation through Facebook chat concerning the status you just posted. The person you are chatting with cares greatly about your experience with the water task.

Please write about the imagined interaction. Make sure to be as detailed as possible. For example, describe the key aspects of your Facebook chat. Was the chat helpful, or not, and why?

You will have 3 minutes.

In the neutral condition, participants were instructed to imagine they were reviewing a product on Amazon and whether or not they would recommend it to a friend:

Imagine that you are shopping for a product on Amazon. Upon finding the product you are looking for, you purchase the product. Imagine that soon after receiving the product, you return to Amazon to write a detailed review of the product.

Please write about the imagined review. Make sure to be as detailed as possible. For example, describe the key aspects of the product you purchased. Was the product helpful or not, and why?

You will have 3 minutes.

Participants were asked to describe these imaginations, in as much detail as possible, using basic word processing software. They were encouraged to continue this process for three minutes.

An imagined interaction was selected for the support manipulation as a way to control what each participant was saying to someone on Facebook. Because we used specific prompts for the interaction, participants were only able to focus on the question posed to them, as opposed to talking to someone about something that was not related to the task they had just completed. Prior research has demonstrated the effectiveness of using imagined interactions. Crisp and Turner (2009) used imagined contact with someone to elicit feelings of prejudice and discrimination.

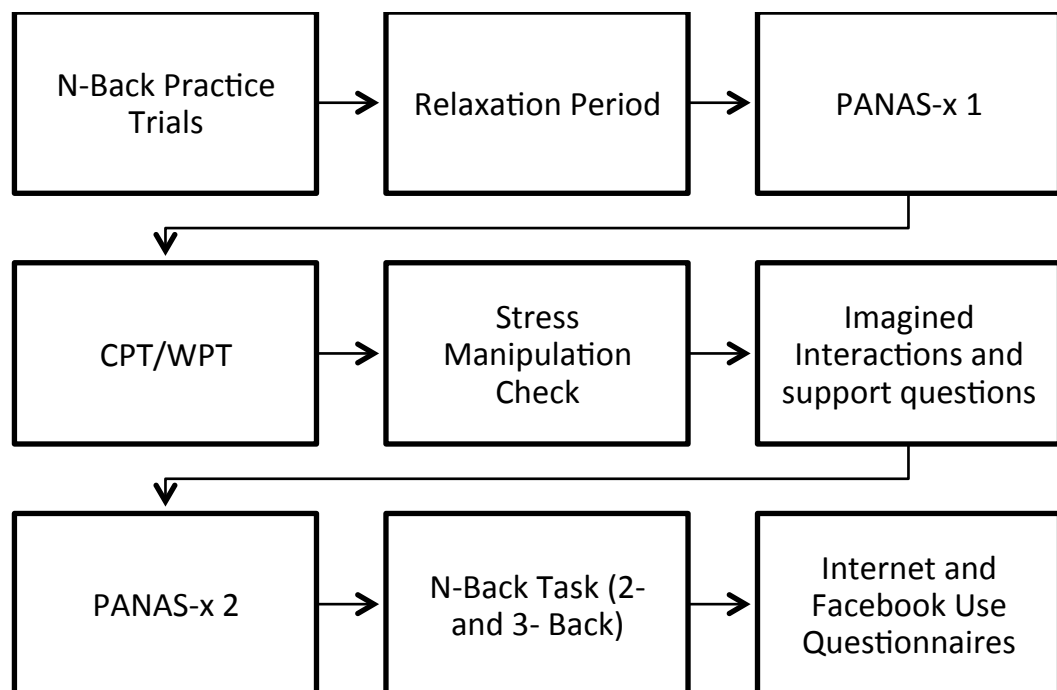
After completion of the imagined interaction, the participants were asked how supported they felt and who they imagined talking with during the interaction. All participants then completed the PANAS-x once again to assess any changes in the participant's own report of their affective state.

Next, participants were asked to complete the computerized working memory task (N-Back task) that they completed practice trials for earlier in the experiment. Reaction time data and accuracy data for the N-Back task was collected and analyzed to assess any potential effect from the stressor.

Following the N-Back task, participants were asked to complete a number of questionnaires that included measures of internet and Facebook use, as well as demographic information.

At the conclusion of the experiment, participants were debriefed and thanked for their time. For a timeline of the experiment, see Figure 2.

Figure 2. Timeline of Experiment



## Results

### Stress

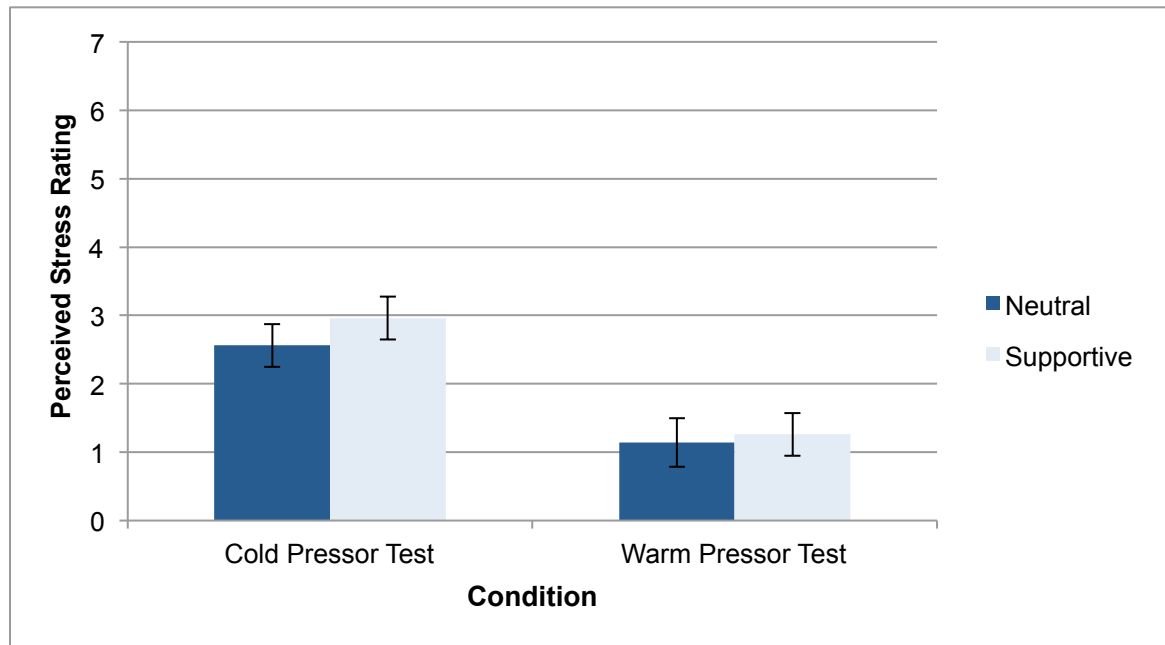
Mean perceived stress ratings are shown in Table 2. Average stress scores were calculated for each participant by averaging three items on the stress manipulation check: how stressful, how effortful, and how demanding the water task was. A Mann-Whitney test conducted for the CPT and WPT suggested a significant difference:  $U = 24.5$  ( $Z = -4.29$ ),  $p < .01$  with an effect size of  $r = -.73$ . Participants in the CPT condition reported significantly more perceived stress than those in the WPT condition. There was no significant difference between participants in the supportive and neutral conditions after the CPT:  $U = 30.5$  ( $Z = -.893$ ),  $p = .372$  with an effect size of  $r = -.73$  (Figure 3). A Mann-Whitney test was utilized to correct for the skewed distribution of the scores. There were no differences between males and females for perceived stress in the WPT and CPT conditions.

Table 2: Medians and Interquartile Ranges for Perceived Stress Ratings on CPT and WPT

	CPT $n = 18$	WPT $n = 16$
Perceived Stress Rating Median (IQR)	3 (2.34)	1(1)*

\*significant at  $p < .01$

Figure 3. Average Perceived Stress

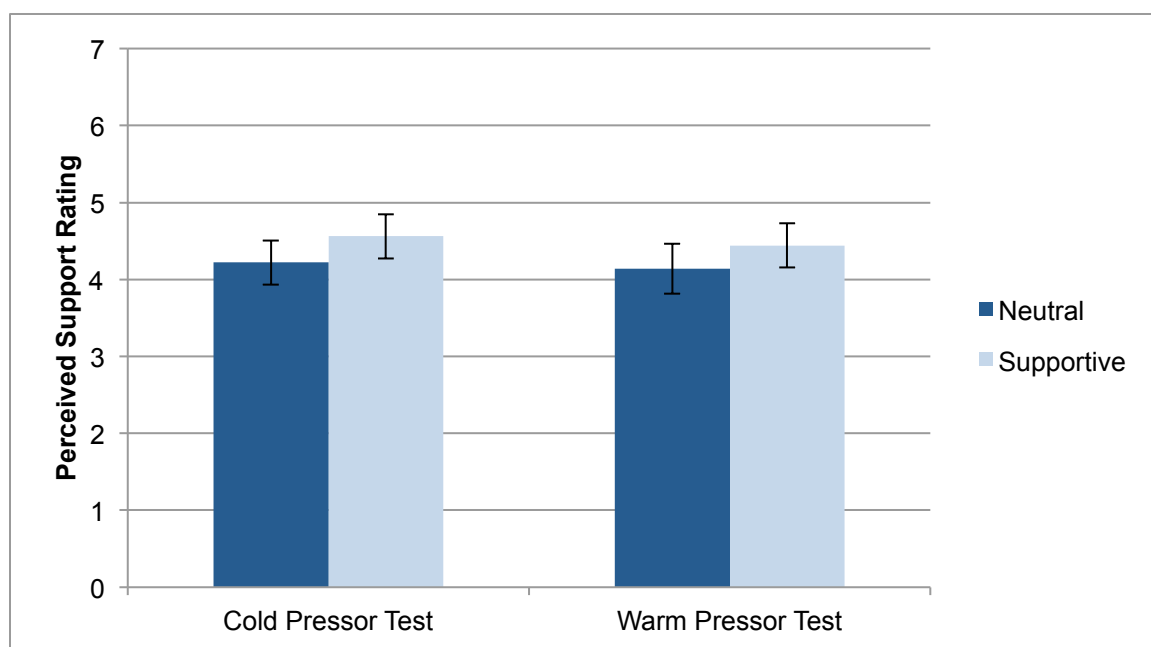


Error bars represent the standard error of the mean.

### Social Support

Support scores were taken from the support manipulation check, completed right after the imagined interaction or Amazon product review (Figure 4). A t-test conducted on the neutral imagined interaction (Amazon product review) and the supportive imagined interaction (imagined Facebook conversation) suggested no significant effect on how supported the participants felt:  $t(32) = -.546, p = .589$ . A 2 (CPT vs. WPT) x 2 (supportive vs. neutral interaction) ANOVA was conducted to assess any potential main effects in perceived support for the CPT ( $F(1,30) = .026, p = .874, \eta^2_p = .001$ ) and WPT ( $F(1,30) = .286, p = .597, \eta^2_p = .009$ ) conditions. There was also no interaction between stress and support: ( $F(1,30) = .001, p = .979, \eta^2_p = .000$ ). There were no gender differences reported in how supported participants felt.

Figure 4. Average Perceived Support



*Error bars represent the standard error of the mean.*

In general, participants reported speaking with a friend about their experience with the water task. Responses for the supportive imagined interaction in the CPT condition included:

The other person that I was chatting with would be sympathetic. They would most likely be asking me if it was painful and how cold the water was. I would be happy that this person was asking me about this because it would show that they care. It would also make me feel better about the water task.

During the neutral interaction (Amazon product review), participants picked a product they wanted to purchase. Responses for the neutral interaction included:

I purchased a book from Amazon today, and I have to say that this was a good buy for me. I was a little offset about the book at first, but once I got a hold of the book and started reading, I wasn't able to put the book down. If I had to recommend this book to another person I definitely would, because it was an absolutely fantastic read. Gripping storyline and a very great progression to the story itself.

When participants were reviewing products on Amazon, the responses were typically positive. Almost everybody reviewed a product positively and would have recommended that product to a friend.

### PANAS-x

Differences in mood scores were assessed with the PANAS-x (Watson & Clark, 1994; see Table 3 for means and test scores). Difference scores were calculated by subtracting the positive and negative affect scores of the first PANAS-x from the positive and negative affect scores of the second PANAS-x. For simplicity, specific items were taken and analyzed from the PANAS-x, for positive affect and negative affect. Positive affect items were active, enthusiastic, attentive, excited, determined, proud, alert, and interested. Negative affect items were guilty, afraid, nervous, distressed, hostile, irritable, upset, ashamed, and scared.

Table 3: Means and Standard Deviations for PANAS-x Difference Scores

	CPT/NEU <i>n</i> = 9	CPT/SUP <i>n</i> = 9	WPT/NEU <i>n</i> = 7	WPT/SUP <i>n</i> = 9
Positive Affect M (SD)	-.04 (.497)	.00 (.726)	-.28 (.524)	-.33 (.434)
Negative Affect M (SD)	-.27 (.638)	-.11 (.229)	-.21 (.423)	-.22 (.68)

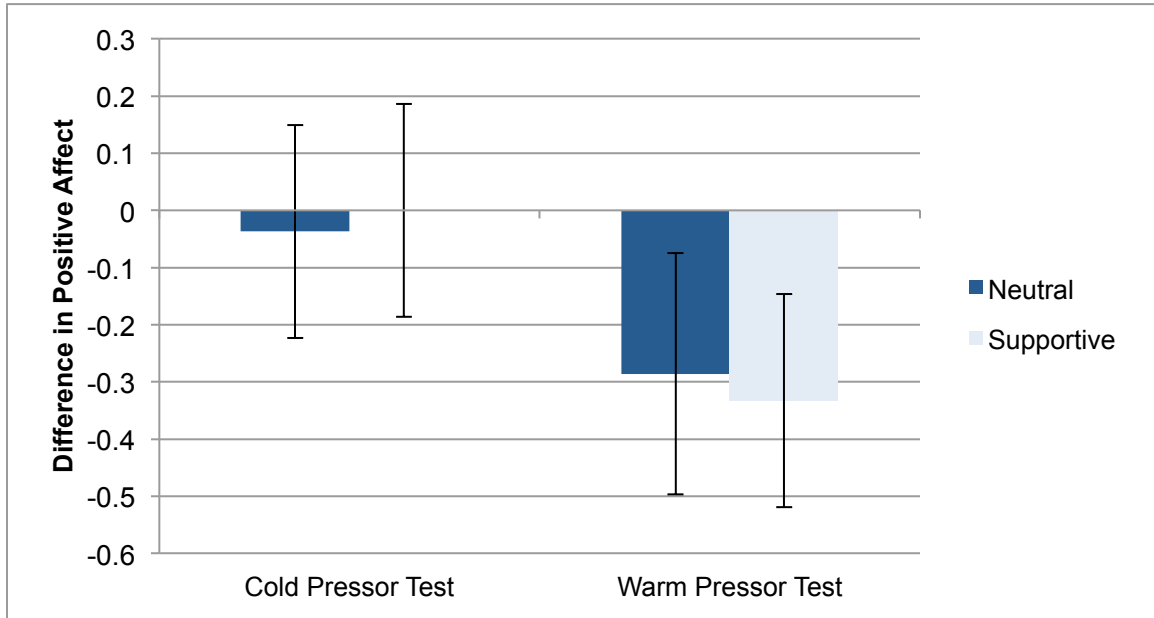
*Note: Means and standard deviations are displayed as follows: M(SD).*

A 2 (PANAS-x Positive Difference Scores, PANAS-x Negative Difference Scores) x 2 (Stress, Support) ANOVA was conducted to determine any potential differences between stress and support. There was no main effect of support for positive affect ( $F(1, 30) = .001, p = .978, \eta^2_p = .000$ ) (Figure 5) or negative affect ( $F(1, 30) = .156, p = .696, \eta^2_p = .005$ ) (Figure 6). No significant interactions were found between stress



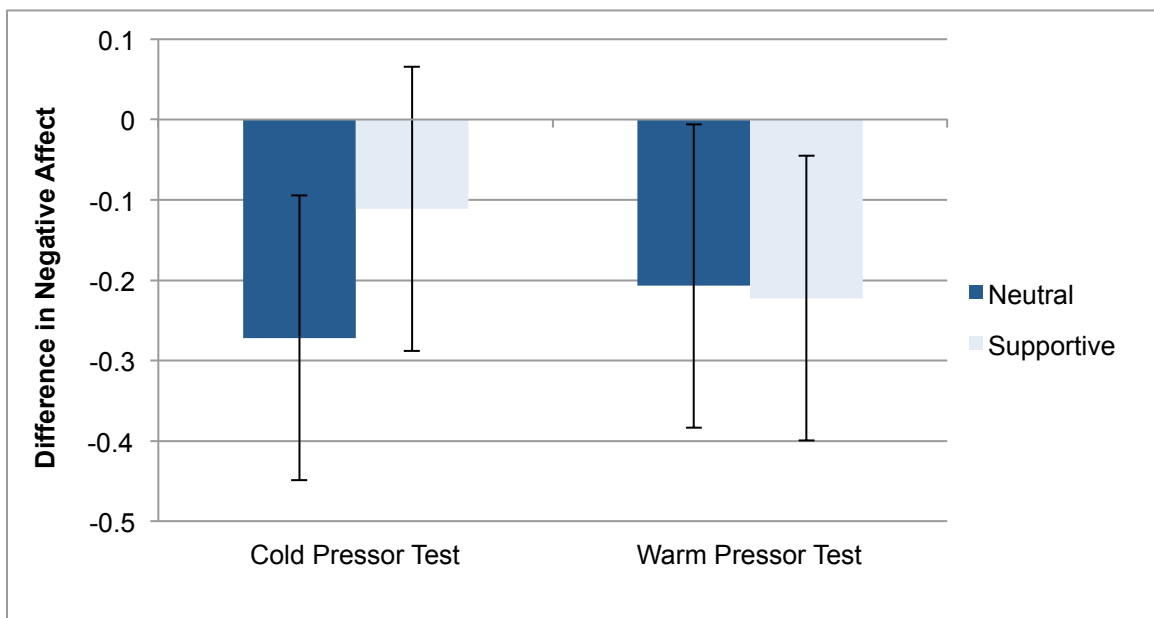
and support for positive affect:  $F(1, 30) = .048, p = .828, \eta^2_p = .002$ . No significant interactions were found between stress and support for negative affect:  $F(1, 30) = .232, p = .634, \eta^2_p = .008$ . There were also no gender differences in positive or negative affect.

Figure 5. Average Difference Scores for Positive Affect



Error bars represent the standard error of the mean.

Figure 6. Average Difference Scores for Negative Affect



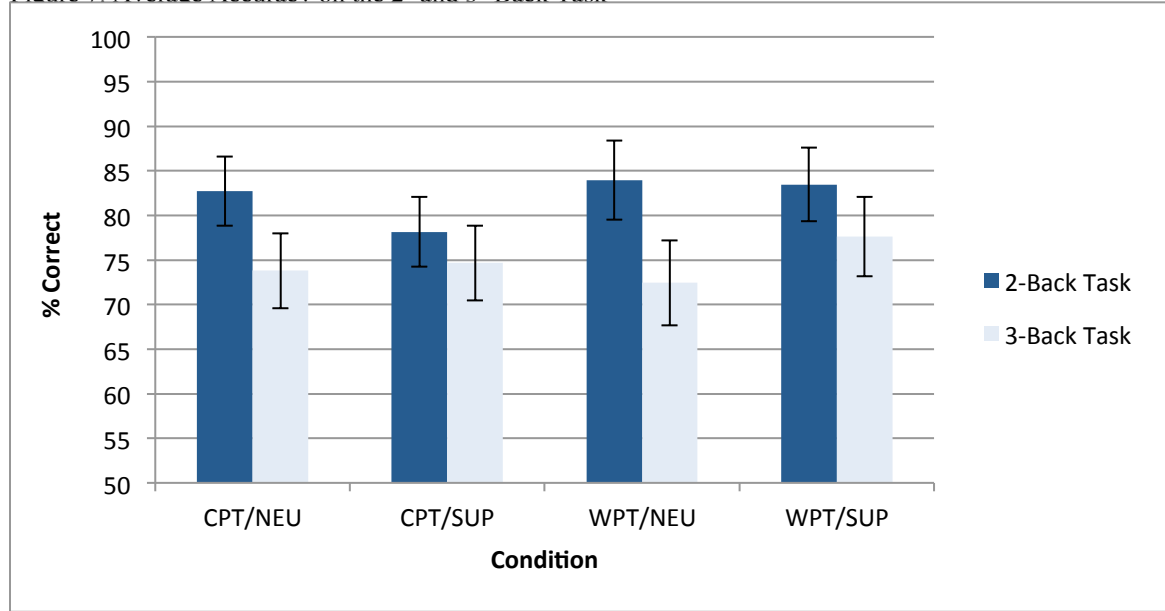
Error bars represent the standard error of the mean.

## Working Memory

Accuracy and reaction times were analyzed for the N-Back task (see Figures 6 and 7 for break down between accuracy and reaction time). One participant's data was excluded from these analyses because of technical difficulties. A paired samples t-test conducted on the 2-Back and 3-Back tasks suggests a significant difference for accuracy:  $t(32) = 5.935, p < .01$ . This result is consistent with other N-Back Task research (Schoofs et al., 2008).

A 2 (2-Back Task, 3- Back Task) x 2 (stress, support) ANOVA was conducted to assess any differences between the 2- and 3- Back tasks. No significant main effects were found for the 2-back and 3- back task for accuracy. Those in the CPT condition did not differ significantly from those in the WPT condition on the 2-back task:  $F(1, 29) = .638, p = .431, \eta^2_p = .022$ . There was also no significant difference between these groups for the 3-back task:  $F(1, 29) = .032, p = .859, \eta^2_p = .001$ . When the data was broken down by support conditions, there were similar results. For the 2-back task, there was no significant main effect:  $F(1, 29) = .380, p = .542, \eta^2_p = .013$ . For the 3-back task, there was also no significant main effect:  $F(1, 29) = .470, p = .498, \eta^2_p = .016$ . There was no significant interaction between stress and support for accuracy on the 2-back task ( $F(1, 29) = .252, p = .619, \eta^2_p = .009$ ) or the 3-back task ( $F(1, 29) = .237, p = .630, \eta^2_p = .008$ ). There were no gender differences in accuracy on the 2-Back and 3-Back task.

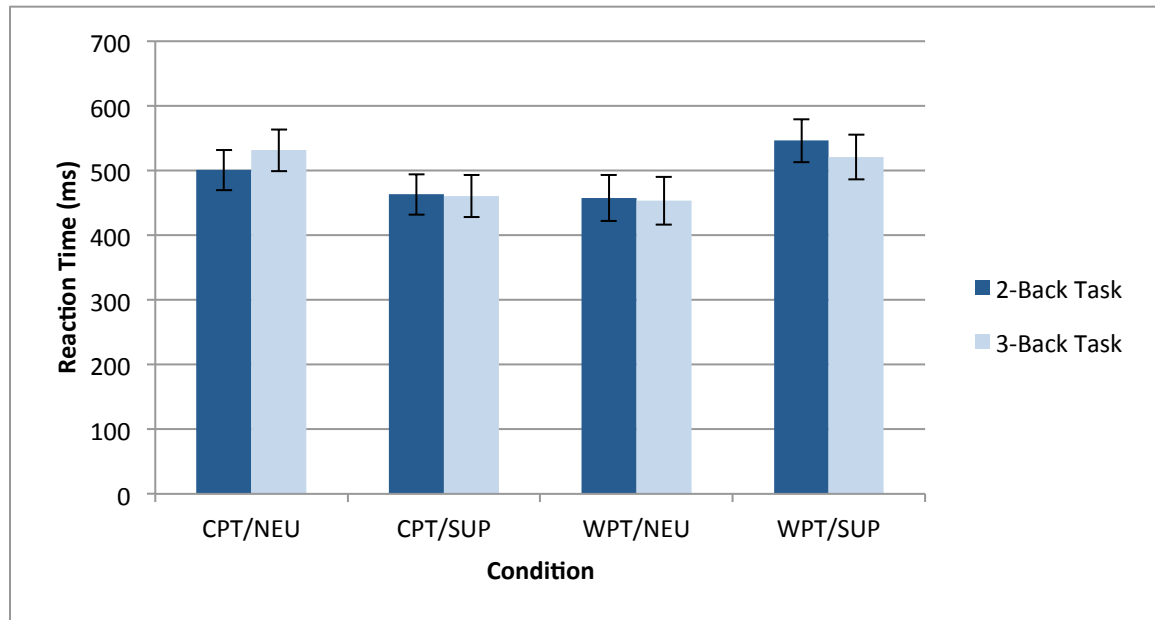
Figure 7. Average Accuracy on the 2- and 3- Back Task



Error bars represent the standard error of the mean

A 2 (2-Back Task, 3-Back Task) x 2 (Stress, Support) was conducted to assess differences in reaction time between the two tasks. There were no significant effects found between the 2-back and 3-back task for reaction time data. Those in the stress condition (CPT) did not differ from those in the non-stress condition (WPT) on the 2-back task:  $F(1, 29) = .365, p = .550, \eta^2_p = .012$ . There was no significant difference between the stress conditions for the 3-back task:  $F(1, 29) = .070, p = .793, \eta^2_p = .002$ . The support conditions, again, showed similar results. For the 2-back task, there was no main effect of support:  $F(1, 29) = .594, p = .447, \eta^2_p = .020$ . For the 3-back task, there was no main effect of support:  $F(1, 29) = .002, p = .963, \eta^2_p = .000$ . There was a trend towards a significant interaction for the 2-back task:  $F(1, 29) = 3.722, p = .046, \eta^2_p = .114$ . There was a significant interaction for the 3-back task:  $F(1, 29) = 4.154, p = .05, \eta^2_p = .125$ . There were no gender differences in reaction time for the 2-back and 3-back task.

Figure 8. Average Reaction Times for 2- and 3- Back Task



Error bars represent the standard error of the mean.

Some exploratory correlations were also conducted to assess any potential relationships between variables. No correlation was found between perceived stress level and support in the imagined interaction condition:  $r = -.284, p = .532$ . No correlation was found between perceived stress level and the neutral support condition:  $r = -.003, p = .993$ .

Perceived stress level was not correlated on the 2-back task with accuracy ( $r = -.161, p = .370$ ) or reaction time ( $r = -.197, p = .271$ ). Perceived stress level was also not correlated on the 3-back task with accuracy ( $r = -.161, p = .398$ ) or reaction time ( $r = -.210, p = .242$ ). Perceived support level was not correlated on the 2-back task with accuracy ( $r = .068, p = .708$ ) or reaction time ( $r = -.186, p = .301$ ). Perceived support level was also not correlated with accuracy ( $r = -.002, p = .992$ ) or reaction time ( $r = .156, p = .387$ ).

## Questionnaires

The Pathological Use Scale, Internet Behaviors and Attitudes Scale, and the Facebook Questionnaire were administered to examine how participants used the internet and Facebook. Means and standard deviations are listed in Table 4. Higher scores on the Pathological Use Scale indicate higher identification with potentially problematic internet behaviors. Higher scores on the Internet Behaviors and Attitudes Scale indicate the extent to which the participants agree with attitudes and behaviors associated with internet use. Higher scores on the Facebook Questionnaire indicate more Facebook use. For simplicity, items two through seven were averaged to gauge how Facebook is used. There were no gender differences in how individuals used the internet.

Table 4. Means and Standard Deviations for Pathological Use Scale, Internet Behaviors and Attitudes Scale, and Facebook Questionnaire

	CPT/NEU <i>n</i> = 9	CPT/SUP <i>n</i> = 9	WPT/NEU <i>n</i> = 7	WPT/SUP <i>n</i> = 9
Pathological Use Scale	1.91(.268)	1.73(.322)	2.14(.337)	1.82(.256)
Internet Behaviors and Attitudes Scale	2.23(.291)	2.12(.297)	2.58(.239)	2.49(.356)
Facebook Questionnaire	3.04(.956)	2.57(.508)	3.17(1.08)	3.04(.469)

*Note: Means and standard deviations are displayed as follows: M(SD).*

Originally, these questionnaires were administered to assess any potential correlations between how participants used the internet and how supported they felt during the interaction. Because there was no significant difference between the supportive and neutral interactions, no further analyses were conducted on the questionnaire data.

## Discussion

The present study examined the relationship between virtual social support, perceived stress, and working memory functioning. We found that the CPT is an effective stressor from self-reported data. The imagined interaction support manipulation did not differ between the neutral and supportive conditions. We did not see any change in working memory functioning between stress conditions, suggesting no working memory deficit.

Consistent with prior research, the CPT was perceived as stressful by all of the participants in the stress condition when compared to those in the WPT condition. Schwabe and colleagues (2008) found that a “socially-evaluated” CPT was effective in eliciting a peak stress response, which mirrors our findings. Schwabe explored the relationship between perceived stress and physiological stress. Individuals in the socially-evaluated cold pressor condition experienced increases in physiological stress compared to those in the CPT (with no social-evaluation) and those in the warm water control conditions. They also noted that all participants in the cold pressor conditions reported feeling more stressed than their warm water counterparts.

The average self-reported stress ratings for the CPT may also indicate that participants were actually not stressed out. Because the average rating was below the midpoint of the questionnaires (7 questions, 4 is the mid-point), the level of stress expected was simply not reached. This could be because the socially evaluated aspect was not strong enough. The participant was being watched and time during the course of the Cold Pressor Test, but they were not being recorded, as was the case with Schwabe (2008). The social pressure was not enough.

Also, when many participants learned of the task they would be doing, they did not seem concerned about what they about to do. Some of them even noted that they spent a lot of time in the ocean or lakes during school vacations. While participant reported being more stressed compared to those in the warm water condition, it is possible they were used to the cold water and did not feel as stressed out.

The imagined interaction was not successful in inducing feelings of social support among participants. The supportive imagined interaction was originally chosen for control purposes, as it is difficult to control how an individual interacts on social networking sites, such as Facebook. Prior research on prejudice and discrimination has indicated the effectiveness and benefits of imagined interactions with others (Crisp & Turner, 2009). Crisp and Turner suggest that imagining face-to-face contact with someone who is prejudiced may allow an individual to have more positive thoughts about the stereotyped individual. While this may be true for prejudice studies, it simply was not the case for the present research. These findings may suggest that imagining feelings of social support may not be as effective as imagining feelings of prejudice.

Participants who completed the neutral interaction (Amazon product review) reported the same amount of stress as participants in the supportive interaction (Facebook imagined interactions). The participants in this condition may have misinterpreted the question they were asked: How supported do you currently feel? Typically, when someone purchases something online, they are excited about. People may have mistaken their excitement for the produce as support. It is also possible participants were thinking about general life support, instead transient support.

There was no difference in PANAS-x scores for either positive or negative affect. Those in the stress condition reported the greatest difference between positive affect scores for the PANAS-x 1 and PANAS-x 2, but this could have been partially due to baseline differences in positive affect. Participants may have also experienced an increase in positive affect because they were glad to no longer have their hand in the frigid water.

Consistent with prior N-Back research, there was a decrease in accuracy on the 3-Back task for all participants when compared to the 2-Back task. The 3-Back task is meant to be more difficult than the 2-Back task, and this is reflected in the data. True to what Schoofs and his colleagues (2013) found, there was no difference in reaction time for those in the stress condition when compared to the no stress condition on the 2- and 3-back tasks. This may suggest that working memory is not modulated by stressful events. Also, participants may have not shown working memory deficits because they were no longer feeling the effects of the CPT.

There were no gender differences in how individuals agreed with internet behaviors and attitudes, how they used Facebook or how they exhibited pathological use behaviors. This could be because of the low sample size in the current study, or it could suggest that males and females use the internet (particularly, Facebook) in the same way.

### **Implications and Limitations**

One limitation of the current study was the low sample size. With only thirty four participants and four separate conditions, the experiment was simply underpowered to assess any differences between groups.



Because of the ineffective support manipulation, future research could be directed at examining social networking sites. Instead of the ineffective imagined interaction used in the current study, actually interacting with some form of social media (real or simulated) could induce greater feelings of social support. These feelings of social support could be further understood by the Buffering Hypothesis (Cohen & Wills, 1985) or the Functional Support Model (Wills, 1991).

The Buffering Hypothesis states that under the right circumstances, social support can protect an individual from the potentially harmful side effects of stressful experiences. The Buffering Hypothesis is usually associated with health outcomes, as stress often has a negative effect on a person's health. With a greater amount of social support; however, the negative health effects can be reduced. A second explanation for the benefits of social support is the Functional Support Model (Wills, 1991). In this model, a person with more personal relationships experiences a positive effect on well-being, which leads to a decrease in negative affect. Being in a better mood can have a positive impact on functioning.

Social networking is a relatively new method of interpersonal communication and is not well understood. Boyd and Ellison (2008) define a social network site as a web based service that encapsulates three different aspects. Users of these sites are able to create a profile with varying levels of privacy, have a list of other people who use the site, and can communicate with others on this list. Social networks, such as Facebook, allow users to communicate with each other, while sharing information about themselves. While using Facebook, people commonly comment and express empathy and sympathy on the posts of people on their friend's list (Liu & Yu, 2013). According to the Pew

Internet Project (“Social Networking Fact Sheet”, 2013), 73% of adults use a social networking site. Of this percentage, 71% use Facebook. This research also found that people typically use social networking sites to stay connected with people in their social circles, have closer relationships with others, and feel as though they are more supported through their internet use.

Another improvement for the support manipulation would be to enhance the neutral condition so that it is truly neutral. Because participants typically wrote good reviews for the Amazon product they imagined purchasing, it is possible they misinterpreted feeling happy about their purchase for social support. Also, when writing a product review, there is an understanding that other people will be reading it, so they may have been writing the review with the intention of helping others. Knowing that they were helping others may have boosted feelings of “support.” This may have led to participants in the neutral condition rating how supported they felt similar to those in the supportive condition. To combat this potential misinterpretation of “support” feelings, a future neutral support interaction could involve scrolling through a webpage with novel pictures. This would ensure that the participants were still engaging in a virtual experience, but have zero contact with another individual, whether on Facebook or someone reading their review on Amazon.

There may not have been any difference in working memory functioning because the participants may have not been stressed out physiologically. This may suggest that physiological stress may be necessary to see working memory deficits associated with stress. Even though we did not measure physiological stress, we may be able to assume no physiological stress response was present in the participants. While participants may

have reported feeling stressed, it is uncertain to know in this case if they elicited an appropriate stress response that could have led to a working memory deficit.

### **Conclusion**

The current research adds to the literature on the Cold Pressor Test: the CPT elicits a self-reported stress response. Additionally, imagined supportive interactions are not effective in determining if an individual is experiencing feelings of social support. For this experiment, it appears that stress has no significant effect on mood or working memory task performance.

## References

- Baddeley, A. (2003). Working Memory: Looking Back and Looking Forward. *Nature Reviews Neuroscience*, 4(10), 829-839. doi:10.1038/nrn1201
- Bloom, J. R. (1990). The relationship of social support and health. *Social Science & Medicine*, 30(5), 635-637. doi:10.1016/0277-9536(90)90162-L
- Boyd, D. M., & Ellison, N. B. (2007). Social network sites: Definition, history, and scholarship. *Journal of Computer-Mediated Communication*, 13(1), 210-230. doi:10.1111/j.1083-6101.2007.00393.x
- Chrousos, G. (2009). Stress and disorders of the stress system. *Nature Reviews Endocrinology*, 5, 374-381.
- Cobb, S. (1976). Social support as a moderator of life stress. *Psychosomatic Medicine*, 38(5), 300-314.
- Cohen, S., & Wills, T.A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin*, 98, 310-357.
- Crisp, R. J., & Turner, R. N. (2009). Can imagined interactions produce positive perceptions?: Reducing prejudice through simulated social contact. *American Psychologist*, 64(4), 231-240. doi:10.1037/a0014718
- Ell, S. W., Cosley, B., & McCoy, S. K. (2011). When bad stress goes good: Increased threat reactivity predicts improved category learning performance. *Psychonomic Bulletin & Review*, 18(1), 96-102. doi:10.3758/s13423-010-0018-0
- Graham, J. M., & Barnow, Z. B. (2013). Stress and social support in gay, lesbian, and heterosexual couples: Direct effects and buffering models. *Journal Of Family Psychology*, 27(4), 569-578. doi:10.1037/a0033420

- Hellhammer, J., & Schubert, M. (2012). The physiological response to Trier Social Stress Test relates to subjective measures of stress during but not before or after the test. *Psychoneuroendocrinology*, 37(1), 119-124. doi:10.1016/j.psyneuen.2011.05.012
- Hines, E. A., & Brown, G. E. (1936). The cold pressor test for measuring the reactivity of the blood pressure: Data concerning 571 normal and hypertensive subjects. *The American Heart Journal*, 11(1), 1-9.
- Ishizuka, K., Hillier, A., & Beversdorf, D. Q. (2007). Effect of the cold pressor test on memory and cognitive flexibility. *Neurocase*, 13, 154-157.
- Jin, B. (2013). How lonely people use and perceive Facebook. *Computers in Human Behavior*, 29(6), 2463-2470. doi:10.1016/j.chb.2013.05.034
- Kraut, R., Kiesler, S., Boneva, B., Cummings, J. N., Helgeson, V., & Crawford, A. M. (2002). Internet paradox revisited. *Journal Of Social Issues*, 58(1), 49-74. doi:10.1111/1540-4560.00248
- Kraut, R., Patterson, M., Lundmark, V., Kiesler, S., Mukophadhyay, T., & Scherlis, W. (1998). Internet paradox: A social technology that reduces social involvement and psychological well-being?. *American Psychologist*, 53(9), 1017-1031. doi:10.1037/0003-066X.53.9.1017
- Kirchner, W. (1958). Age differences in short-term retention of rapidly changing information. *Journal of Experimental Psychology*, 55(4), 352-358.
- Lazarus, R. S., & Folkman, S. (1987). Transactional theory and research on emotions and coping. *European Journal Of Personality*, 1(3), 141-169.
- Liu, C., & Yu, C. (2013). Can Facebook use induce well-being?. *Cyberpsychology, Behavior, and Social Networking*, 16(9), 674-678. doi:10.1089/cyber.2012.0301

- Lupien, S. J., Maheu, F. F., Tu, M. M., Fiocco, A. A., & Schramek, T. E. (2007). The effects of stress and stress hormones on human cognition: Implications for the field of brain and cognition. *Brain And Cognition*, 65(3), 209-237.  
doi:10.1016/j.bandc.2007.02.007
- McRae, A. L., Saladin, M. E., Brady, K. T., Upadhyaya, H., Back, S. E., & Timmerman, M. A. (2006). Stress Reactivity: Biological and Subjective Responses To The Cold Pressor And Trier Social Stressors. *Human Psychopharmacology: Clinical and Experimental*, 21(6), 377-385.
- Morahan-Martin, J., & Schumacher, P. (2000). Incidence and correlates of pathological Internet use among college students. *Computers in Human Behavior*, 16(1), 13-29.
- Oei, N. Y. L., Everaerd, W. T. A. M., Elzinga, B. M., Van Well, S., & Bermond, B. (2006). Psychosocial stress impairs working memory at high loads: An association with cortisol levels and memory retrieval. *Stress*, 9(3), 133-141.
- Ross, C., Orr, E.S., Sisic, M., Arseneault, J. M., Simmering, M. G., & Orr, R. R. (2009). Personality and motivations associated with Facebook use. *Computers in Human Behavior*, 25(2), 578-586.
- Schoofs, D., Preuß, D., & Wolf, O. T. (2008). Psychosocial stress induces working memory impairments in an n-back paradigm. *Psychoneuroendocrinology*, 33(5), 643-653. doi:10.1016/j.psyneuen.2008.02.004
- Schoofs, D., Pabst, S., Brand, M., & Wolf, O. T. (2013). Working memory is differentially affected by stress in men and women. *Behavioural Brain Research*, 241144-153. doi:10.1016/j.bbr.2012.12.004

- Schwabe, L., Haddad, L., & Schachinger, H. (2008). HPA axis activation by a socially evaluated cold-pressor test. *Psychoneuroendocrinology*, 33(6), 890-895.
- Smeets, T., Otgaar, H., Candel, I., & Wolf, O. (2008). True or false? Memory is differentially affected by stress-induced cortisol elevations and sympathetic activity at consolidation and retrieval. *Psychoneuroendocrinology*, 33(10), 1378-1386.
- Social Networking Fact Sheet. (2013, December 27). *Pew Research Centers Internet American Life Project RSS*. Retrieved March 9, 2014, from <http://www.pewinternet.org/fact-sheets/social-networking-fact-sheet/>
- Trepte, S., Reinecke, L., & Juechems, K. (2012). The social side of gaming: How playing online computer games creates online and offline social support. *Computers In Human Behavior*, 28(3), 832-839. doi:10.1016/j.chb.2011.12.003
- von Baeyer, C. L., Piira, T., Chambers, C. T., Trapanotto, M., & Zeltzer, L. K. (2005). Guidelines for the cold pressor task as an experimental pain stimulus for use with children. *The Journal of Pain*, 6(4), 218-227.
- Watson, D., & Clark, L.A. (1994) *Manual for the Positive and Negative Affect Schedule (expanded form)*. Unpublished Manuscript, University of Iowa. Retrieved from <http://www.psychology.uiowa.edu/faculty/clark/panas-x.pdf>
- Wills, T. A. Social Support and Interpersonal Relationships. In M. S Clark (Ed.) *Prosocial behavior*. Newbury Park, CA: Sage Publications.

## Appendix A

### PANAS-x

This scale consists of a number of words and phrases that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you have felt this way right now (that is, at the present moment).

Use the following scale to record your answers:

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely
_____ cheerful	_____ sad	_____ active	_____ angry at self	
_____ disgusted	_____ calm	_____ guilty	_____ enthusiastic	
_____ attentive	_____ afraid	_____ joyful	_____ downhearted	
_____ bashful	_____ tired	_____ nervous	_____ sheepish	
_____ sluggish	_____ amazed	_____ lonely	_____ distressed	
_____ daring	_____ shaky	_____ sleepy	_____ blameworthy	
_____ surprised	_____ happy	_____ excited	_____ determined	
_____ strong	_____ timid	_____ hostile	_____ frightened	
_____ scornful	_____ alone	_____ proud	_____ astonished	
_____ relaxed	_____ alert	_____ jittery	_____ interested	
_____ irritable	_____ upset	_____ lively	_____ loathing	
_____ delighted	_____ angry	_____ ashamed	_____ confident	
_____ inspired	_____ bold	_____ at ease	_____ energetic	
_____ fearless	_____ blue	_____ scared	_____ concentrating	



\_\_\_\_\_ disgusted \_\_\_\_\_ shy \_\_\_\_\_ drowsy \_\_\_\_\_ dissatisfied  
with self with self

## Appendix B

### Stress Appraisal

For each statement, please respond with a number to indicate how you are feeling right now regarding the water task.

1-----2-----3-----4-----5-----6-----7  
Strongly Disagree Strongly Agree

- \_\_\_\_\_ 1. The water task was very demanding.
- \_\_\_\_\_ 2. I experienced discomfort during the water task.
- \_\_\_\_\_ 3. The water task was very effortful.
- \_\_\_\_\_ 4. The water task was very stressful.
- \_\_\_\_\_ 5. The water task was threatening.
- \_\_\_\_\_ 6. The water task was a positive challenge for me.
- \_\_\_\_\_ 7. This task was painful for me.

### Appendix C Internet Behaviors and Attitudes Scale

For each item, please indicate whether you agree or disagree with the statement.

1 ----- 2 ----- 3 ----- 4  
 strongly disagree    disagree                    agree                    strongly agree

- \_\_\_\_\_ 1. Going online has made it easier for me to make friends.
- \_\_\_\_\_ 2. I am friendlier online than in real life.
- \_\_\_\_\_ 3. I sometimes go online to escape from pressures.
- \_\_\_\_\_ 4. I open up more to people online than I do in other forms of communication.
- \_\_\_\_\_ 5. I have a network of friends made online.
- \_\_\_\_\_ 6. When I am online, I feel totally absorbed.
- \_\_\_\_\_ 7. The anonymity of being online is liberating.
- \_\_\_\_\_ 8. I have more fun with people I know online than those I know from elsewhere.
- \_\_\_\_\_ 9. I have pretended to be someone of the opposite sex while online.
- \_\_\_\_\_ 10. I am more myself online than in real life.
- \_\_\_\_\_ 11. Most of my friends I know from online.
- \_\_\_\_\_ 12. I have shared intimate secrets online.
- \_\_\_\_\_ 13. Sometimes I pretend I am someone I am not while online.
- \_\_\_\_\_ 14. I prefer communicating online to face-to-face communication.
- \_\_\_\_\_ 15. My online friends understand me better than other people.
- \_\_\_\_\_ 16. I feel competent in my ability to use online services.
- \_\_\_\_\_ 17. I am comfortable using online services.
- \_\_\_\_\_ 18. Going online has made it easier for me to do research.

- \_\_\_\_\_ 19. I like the speed of communicating online.
- \_\_\_\_\_ 20. Online communication lets me control when I want to communicate.
- \_\_\_\_\_ 21. Being online has made it easier to communicate with people I know.
- \_\_\_\_\_ 22. I avoid going online for information because there is too much to weed through.
- \_\_\_\_\_ 23. I prefer telephoning to communicating online.
- \_\_\_\_\_ 24. I feel less connected interpersonally when I communicate online.
- \_\_\_\_\_ 25. I have lurked online but never entered a conversation online.

## Appendix D Pathological Use Scale

For each item, please indicate whether you agree or disagree with the statement.

1 ----- 2 ----- 3 ----- 4  
 strongly disagree    disagree                    agree                    strongly agree

1. I have never gotten into arguments with a significant other over being online.
2. I have been told I spend too much time online.
3. If it has been a while since I last logged on, I find it hard to stop thinking about what will be waiting for me when I do.
4. My work and/or school performance has not deteriorated since I started going online.
5. I feel guilty about the amount of time I spend online.
6. I have gone online to make myself feel better when I was down or anxious.
7. I have attempted to spend less time online but have not been able to.
8. I have routinely cut short on sleep to spend more time online.
9. I have used the Internet to talk to others at times when I was feeling isolated.
10. I have missed classes or work because of online activities.
11. I have gotten into trouble with my employer or school because of being online.
12. I have missed social engagements because of online activities.
13. I have tried to hide from others how much time I am actually online.

## Appendix E

### Facebook Questionnaire

**1. On average, approximately how many minutes per day do you spend on Facebook? \_\_\_\_\_**

## 2. Facebook is part of my everyday activity.

1 ----- 2 ----- 3 ----- 4 ----- 5  
strongly disagree   disagree   neutral   agree  
strongly agree

### 3. I am proud to tell people I'm on Facebook.

1 ----- 2 ----- 3 ----- 4 ----- 5  
strongly disagree   disagree   neutral   agree  
strongly agree

**4. I dedicate a part of my daily schedule to Facebook.**

1 ----- 2 ----- 3 ----- 4 ----- 5  
strongly disagree   disagree   neutral   agree  
strongly agree

**5. I feel out of touch when I haven't logged on to Facebook for a while.**

1 ----- 2 ----- 3 ----- 4 ----- 5  
strongly disagree   disagree   neutral   agree  
strongly agree

**6. I feel I am part of the Facebook community.**

1 ----- 2 ----- 3 ----- 4 ----- 5  
strongly disagree    disagree            neutral            agree  
strongly agree

**7. I would be sad if Facebook shut down.**

1 ----- 2 ----- 3 ----- 4 ----- 5  
strongly disagree   disagree   neutral   agree  
strongly agree

## 8. Who can see your Facebook profile?

- a.) Only my friends
- b.) All networks and friends
- c.) some networks/all friends
- d.) don't know

**9. Do you use the Limited Profile List to prevent certain people from seeing certain aspects of your profile?**

Yes

No

Don't Know

**10. Approximately how many friends are on your Facebook friends list?**

\_\_\_\_\_

**11. How many Networks do you belong to? \_\_\_\_\_**

**12. Approximately how many Photo Albums do you presently have on Facebook?**

\_\_\_\_\_

**13. Which function do you prefer more?**

a.) Facebook wall

b.) Facebook messages

**14a. How often do you post on other people's Walls?**

i.) More than once daily

ii.) once daily

iii.) 2 or more times weekly

iv.) once weekly

v.) once monthly

vi.) less than once monthly

vii.) a few times per year

viii.) less than once per year

**14b. Whose Walls do you post most frequently on?**

a.) People from your friends list

b.) people who belong to the same groups you do

c.) random people

**14c. How often do you check your own Wall?**

i.) More than once daily

ii.) once daily

iii.) 2 or more times weekly

iv.) once weekly

v.) once monthly

vi.) less than once monthly

vii.) a few times per year

viii.) less than once per year

**15a. How often do you send private Facebook messages?**

- i.) More than once daily
- ii.) once daily
- iii.) 2 or more times weekly
- iv.) once weekly
- v.) once monthly
- vi.) less than once monthly
- vii.) a few times per year
- viii.) less than once per year

**15b. To whom do you send private Facebook messages most frequently?**

- a.) People from your friends list
- b.) People who belong to the same groups you do
- c.) Random people

**16a. How many events have you attended that were coordinated on Facebook?**

\_\_\_\_\_

**16b. How many Facebook events have you created?** \_\_\_\_\_**17. How often do you change your Facebook status?**

- i.) More than once daily
- ii.) once daily
- iii.) 2 or more times weekly
- iv.) once weekly
- v.) once monthly
- vi.) less than once monthly
- vii.) a few times per year
- viii.) less than once per year

**18. Approximately how long have you had your Facebook profile?**

- a.) 6 months
- b.) 1 year
- c.) 1.5 years
- d.) 2 years
- e.) 2.5 years
- f.) 3+ years

**19. How satisfied are you with Facebook, overall?**

- a.) Not satisfied at all
- b.) Barely satisfied
- c.) Neutral
- d.) Satisfied
- e.) Very Satisfied



**20a. Why do you like Facebook? (Select all that apply)**

- a.) It is how I communicate with my current friends
- b.) It provides a distraction from my schoolwork
- c.) It allows me to communicate with people from my past
- d.) It allows me to collect information on people I am interested in
- e.) It provides me with information (e.g., in groups)

Appendix F  
Demographic Survey

*Please list your age (years):* \_\_\_\_\_

*Please provide your gender:* \_\_\_\_\_

*Please provide your major:* \_\_\_\_\_

*Please indicate your year in college:*

First          Second          Third          Fourth          Other \_\_\_\_\_

*Please indicate your relationship status:*

Single          Dating          Engaged          Married          Divorced          Widowed

*Do you have a Facebook account?*

Yes    No    Yes but don't use it

Would you consider yourself to be an introvert or an extrovert? \_\_\_\_\_

## Appendix G

### IRB Approval Information

UMaine Institutional Review Board  
Approved for Use Through:

#### Informed Consent Form- Cold Pressor Test

NOV 19 2014

#### Informed Consent

You are invited to participate in a research project being conducted by Erin Perry, an undergraduate student in the Department of Psychology in the University of Maine. The research is being supervised by Dr. Shawn Ell, an Associate Professor in the Department of Psychology. The purpose of this research is to investigate how virtual interactions may influence how you respond to a challenging task and their impact on memory. To be eligible for this study, you must meet all of the following criteria:

- At least 18 years of age
- Not pregnant
- No history of cardiovascular disease
- No history of fainting or seizures
- No history of frostbite
- No open cuts or sores on your right hand
- No history of Reynaud's phenomenon
- No history of anxiety disorders

#### **What Will You Be Asked to Do?**

If you choose to participate, you will be asked to engage in a challenging task. Specifically, you will be asked to submerge your hand in ice water for up to three minutes. Afterwards, you will be asked to engage in an imagined virtual interaction with a friend (similar to what you might experience on Facebook). You will be asked to complete a number of questionnaires asking you to rate your general internet and Facebook use (e.g., "I am comfortable using online services."; "Facebook is part of my everyday activity," as well as about your current stress level (e. g., "The task was very stressful.") and mood.

You will also be asked to complete a computerized memory task. In this task you will be presented with a series of numbers and asked to indicate if you have seen them previously using keys on a keyboard.

The experiment will take approximately two hours.

#### **Risks**

It is likely that you will experience discomfort while submerging your hand in the ice water. Importantly, you may remove your hand at any time. In addition, you may be uncomfortable answering some of the questions. You may skip any questions that you would rather not answer.

#### **Benefits**

It is important that you understand that there is no direct benefit to you anticipated from your participation in this study. This research may help us learn more about how virtual interactions influence how people respond to stress and the impact of these factors on memory.

### **Compensation**

Individuals participating in fulfillment of a course requirement (e.g., PSY 100) will receive two course credits in return for any amount of participation. If you are in another psychology course and signed up for this study using Sona, you will receive the extra credit points that your instructor has specified for participation. There is no compensation for individuals that are not participating in fulfillment of a course requirement.

### **Confidentiality**

All data will be anonymous. The information obtained in this study may be shared with other scientists and/or presented in research reports. Importantly, neither your name, nor any other personally identifiable information, will be on any of the data.

Your data will be securely stored in Dr. Ell's laboratory indefinitely. Erin Perry and Dr. Ell will be the only people who have access to the data.

### **Voluntary**

Participation is voluntary. If you choose to take part in this study, you may stop at any time. You may skip any questions you do not wish to answer.

### **Contact Information**

If you have any questions about this study, you may contact Erin Perry (email: [erin.perry@umit.maine.edu](mailto:erin.perry@umit.maine.edu)) or Dr. Shawn Ell (581-2037, 360 Little Hall, or email: [shawn.ell@umit.maine.edu](mailto:shawn.ell@umit.maine.edu)). If you have any questions about your rights as a participant, please contact Gayle Jones, Assistant to the University of Maine's Protection of Human Subjects Review Board, at 581-1498 (email: [gayle.jones@umit.maine.edu](mailto:gayle.jones@umit.maine.edu)).

Your signature below indicates that you have read the above information and agree to participate. Your signature also verifies that you meet all of the inclusion criteria outlined in the beginning of the consent. You will receive a copy of this form.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

UMaine Institutional Review Board  
Approved for Use Through:

NOV 19 2014

UMaine Institutional Review Board  
Approved for Use Through:

### **Informed Consent Form- Warm Pressor Test**

NOV 19 2014

#### **Informed Consent**

You are invited to participate in a research project being conducted by Erin Perry, an undergraduate student in the Department of Psychology in the University of Maine. The research is being supervised by Dr. Shawn Ell, an Associate Professor in the Department of Psychology. The purpose of this research is to investigate how virtual interactions may influence how you respond to a challenging task and their impact on memory. To be eligible for this study, you must meet all of the following criteria:

- At least 18 years of age
- Not pregnant
- No history of cardiovascular disease
- No history of fainting or seizures
- No history of frostbite
- No open cuts or sores on your right hand
- No history of Reynaud's phenomenon
- No history of anxiety disorders

#### **What Will You Be Asked to Do?**

If you choose to participate, you will be asked to engage in a challenging task. Specifically, you will be asked to submerge your hand in warm water for up to three minutes. Afterwards, you will be asked to engage in an imagined virtual interaction with a friend (similar to what you might experience on Facebook). You will be asked to complete a number of questionnaires asking you to rate your general internet and Facebook use (e.g., "I am comfortable using online services."; "Facebook is part of my everyday activity," as well as about your current stress level (e. g. "The task was very stressful.") and mood.

You will also be asked to complete a computerized memory task. In this task you will be presented with a series of numbers and asked to indicate if you have seen them previously using keys on a keyboard.

The experiment will take approximately two hours.

#### **Risks**

It is likely that you may experience discomfort while submerging your hand in the warm water. Importantly, you may remove your hand at any time. In addition, you may be uncomfortable answering some of the questions. You may skip any questions that you would rather not answer.

#### **Benefits**

It is important that you understand that there is no direct benefit to you anticipated from your participation in this study. This research may help us learn more about how virtual interactions influence how people respond to stress and the impact of these factors on memory.

### **Compensation**

Individuals participating in fulfillment of a course requirement (e.g., PSY 100) will receive two course credits in return for any amount of participation. If you are in another psychology course and signed up for this study using Sona, you will receive the extra credit points that your instructor has specified for participation. There is no compensation for individuals that are not participating in fulfillment of a course requirement.

### **Confidentiality**

All data will be anonymous. The information obtained in this study may be shared with other scientists and/or presented in research reports. Importantly, neither your name, nor any other personally identifiable information, will be on any of the data.

Your data will be securely stored in Dr. Ell's laboratory indefinitely. Erin Perry and Dr. Ell will be the only people who have access to the data.

### **Voluntary**

Participation is voluntary. If you choose to take part in this study, you may stop at any time. You may skip any questions you do not wish to answer.

### **Contact Information**

If you have any questions about this study, you may contact Erin Perry (email: [erin.perry@umit.maine.edu](mailto:erin.perry@umit.maine.edu)) or Dr. Shawn Ell (581-2037, 360 Little Hall, or email: [shawn.ell@umit.maine.edu](mailto:shawn.ell@umit.maine.edu)). If you have any questions about your rights as a participant, please contact Gayle Jones, Assistant to the University of Maine's Protection of Human Subjects Review Board, at 581-1498 (email: [gayle.jones@umit.maine.edu](mailto:gayle.jones@umit.maine.edu)).

Your signature below indicates that you have read the above information and agree to participate. Your signature also verifies that you meet all of the inclusion criteria outlined in the beginning of the consent. You will receive a copy of this form.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

UMaine Institutional Review Board  
Approved for Use Through:

NOV 19 2014

### Author's Biography

Erin Perry was born on March 4, 1992 in Bayreuth, Germany. She was raised all over the world as an Army Brat. Erin graduated from Rio Rancho High School in Rio Rancho, NM in 2010. Erin will graduate from the University of Maine with a Bachelors of Arts in Psychology with a concentration in Abnormal and Social Psychology. During her time at the University of Maine, Erin worked as a research assistant in a cognitive psychology lab under the supervision of Dr. Ell. She also received a research fellowship from the College of Liberal Arts and Sciences in support of her Honors Thesis and was a member of Psi Chi, an international psychology honor society. Additionally, Erin worked as a peer tutor with The Tutor Program on campus. After taking a year off, Erin hopes to pursue a Ph. D. in Social Psychology and continue to conduct research on social networking and Facebook.